

Establishment of an International Irradiated Concrete Information Exchange Working Group

**Thomas M. Rosseel
Oak Ridge National Laboratory**

1. Executive Summary:

This report provides a summary of the “International Irradiated Concrete Information Exchange Framework Meeting,” which was held March 12-14, 2014, at the Hotel Colon in Barcelona, Spain for the purpose of establishing an international irradiated concrete information-exchange working group. Specifically, it describes the background, goals, meeting summary, and the next steps in formalizing an irradiated concrete information-exchange working group.

Presentations on the latest results of neutron and gamma irradiation experiments, including unexpected experimental difficulties, proposed irradiation experiments, the re-evaluation of past irradiation data and model to address first order affects, and numerical simulations were given and discussed. Moreover, a draft charter for a new international organization, the International Committee on Irradiated Concrete (ICIC), based on the International Group on Radiation Damage Mechanisms (IGRDM) in reactor pressure vessels, was proposed and vigorously discussed. The draft charter identified the objectives of the organization, membership requirements and obligations, organizational structure, topics for technical discussions, dissemination of public and member information, and meeting format and frequency. At the conclusion of the meeting, the participants reached a consensus to move forward with the new organization and that a follow-up meeting should be held within six months to finalize the charter. The participants elected Dr. Rosseel, Acting Chair, and Dr. Carlos Castelao, Consejo de Seguridad Nuclear, (CSN), Acting Vice Chair, to lead the interim process.

2. Background:

Understanding the effects of radiation on concrete is important in determining long-term or extended operating performance of concrete structures in existing nuclear power plants (NPPs). Not surprisingly, this issue is being addressed by research organizations and utilities across the globe. In the last twenty months, the Materials Aging and Degradation Pathway has been actively working to build international partnerships and collaborations in an effort to better define the issues, develop a sound approach to resolving the major questions, and maximizing resources.

For example, multiple discussions beginning in June 2012 have been held with Japanese research organizations participating in the Japan Aging Management Program for Systems and Structures (JAMPSS). The focus has been on opportunities to review data from gamma irradiation studies of prototypical concrete, providing suggestions for additional neutron irradiation experiments underway at the Halden Reactor Project, Institute for Energy Technology, JEEP-2 reactor facility, and developing a better understanding of the effects of radiation on concrete degradation. In June

2013, discussions were initiated with VTT Technical Research Center and Fortum Corporation in Helsinki. The focus has been on opportunities to share resources and data, as well as to participate in an international effort to evaluate the potential for radiation-induced degradation, and to develop a better understanding of the effects of radiation on structural concrete. Finally, discussions also were initiated in June 2013 with the Research Centre Rez, Czech Republic, concerning opportunities to perform accelerated neutron studies at the LVR-15 reactor and post irradiation evaluation (PIE) at the Czech Technical University in Prague in collaboration with the Electric Power Research Institute (EPRI).

The foundation for this meeting has been the understanding that international cooperation will provide the best opportunities to share resources, acquire valuable specimens from decommissioned nuclear power plants, and build a systematic database to provide a framework for decisions concerning extended operation of nuclear power plants in a timely and efficient manner.

3. Purpose and Goals:

The purpose of this meeting was two-fold. First, to develop the framework for exchanging information on a broad set of topics related to the effects of irradiation on concrete used in NPPs by those who are actively pursuing research, were active in the field, or wish to contribute to the advancing the current state of knowledge. And second, to provide a forum for discussing issues that advance the state of knowledge of the effects of irradiation on structural concrete used in nuclear reactor facilities including storage sites.

The first portion of the meeting included presentations and discussions on past and current irradiated concrete research and / or issues related to irradiated concrete. The second portion of the meeting focused on establishing the framework for exchanging information. This included a discussion of the types of information that could be exchanged, the level of release, and the framework for cooperation including resource and data sharing.

The final portion of the meeting was the decision or commitment by attendees to participate in the information exchange. By agreeing to continuing discussions and interactions, the participants have tentatively agreed to the establishment of a new organization and a plan to determine the frequency and location of future International Committee on Irradiated Concrete meetings. It is anticipated that future meetings will be held on a rotating schedule in Europe, the US, and Japan.

4. Meeting Summary:

Dr. Rosseel, Oak Ridge National Laboratory, organized and chaired the International Irradiated Concrete Information Exchange Framework Meeting in Barcelona, Spain, on March 12-14, 2014. Nineteen researchers from five countries attended the meeting, which was held at the Hotel Colon. Representatives from four other countries expressed strong interest in participating but due to conflicts were unable to send representatives. The local host for the meeting was Professor Carmen Andrade, Consejo Superior de Investigaciones Científicas – CSIC (Spanish National Research Council).

Presentations on the latest results of neutron and gamma irradiation experiments, including unexpected experimental difficulties, proposed irradiation experiments, the re-evaluation of past irradiation data and models to address first order affects, and numerical simulations were given and enthusiastically discussed in the technical portion of the meeting.

The technical talks presented at the meeting are listed below:

US: ORNL: LWRS Research Program on the Effects of Radiated on Structural Concrete (Rosseel)

Finland: Fortum: "Research on Irradiation Effects on Concrete Structures at the Loviisa NPP" (Eurajoki)

Spain: Technical Committee of Zorita: Harvesting Concrete from Zorita (Andrade)

US: EPRI: Long Term Operations Concrete Research Program (Wall)

Czech Republic: UJV Rez: Containment and RPV Concrete Cavity Research Activities (Zdarek)

US: ORNL: Perspectives on Radiation Effects in Concrete: Review of Past Irradiation Programs and Determination of First Order Effects. (Field)

Finland: VTT: Centre for Nuclear Safety (Ferreira)

Japan: Mitsubishi Research Institute: Introduction - Japan Aging Management Program on System Safety (JAMPSS) (Takizawa)

Japan: Kajima Corporation: Outline of Research of Irradiation Effects of Concrete Structure in JAMPSS (Kontani)

Japan: Kajima Corporation: JAMPSS: Gamma-ray Irradiation Test Results (Kontani)

Japan: Nagoya University: JAMPSS: Preparation for Neutron Irradiation Experiments (Maruyama)

Japan: Nagoya University: JAMPSS: Numerical Simulation for Irradiated Concrete (Maruyama)

The second portion of the meeting focused on establishing the framework for exchanging information. A draft charter for a new international organization, the International Committee on Irradiated Concrete (ICIC), based on the International Group on Radiation Damage Mechanisms (IGRDM) in RPVs, was proposed and vigorously discussed. This included a discussion of the objectives of the proposed organization, membership requirements and obligations, organizational structure, topics for technical discussions, dissemination of public and member information, and meeting format and frequency.

The topics discussed were as follows:

Proposed Organization Structure for an **International Committee on Irradiated Concrete** (Rosseel)

Information Exchange Discussion: **Objectives** (Rosseel / All)

Regulator's Position on **Information Security** (CSN: Castelao and US NRC: Sircar / All)

Information Exchange Discussion: **Dissemination of Member Information** (Rosseel / All)

Type of information (Summaries, presentations, papers, data)

Level of release (Public, participants only)

Website (Distribution control)

Information Exchange Discussion: **Framework / Areas for Cooperation** (Rosseel / All)

Resource Sharing (Rosseel/ All)

Concrete cores

Pre-IE characterization

PIE characterization

Round Robin testing

Data sharing

Information Exchange Discussion: **Meeting Format** (Rosseel / All)

Open sessions (regulators, interested technical experts) / closed sessions

Frequency of meetings

Future meeting locations

Information Exchange Discussion: **Organizational Structure** (Rosseel / All)

5. Outcome and Next Steps:

The final portion of the meeting focused on making a decision or commitment by attendees to participate in the information exchange. At the conclusion of the meeting, the participants reached a consensus to move forward with the International Committee on Irradiated Concrete and that a follow-up meeting should be held within six months to finalize its charter and elect an executive committee. Moreover, the participants endorsed a plan to determine the frequency and location of future ICIC meetings. It is anticipated that future meetings will be held on a rotating schedule in Europe, the US, and Japan. The meeting concluded with the election of Dr. Rosseel, Acting Chair, and Dr. Carlos Castelao, Consejo de Seguridad Nuclear, (CSN), Acting Vice Chair, to lead the interim process.

REVISION (1) OF THE DRAFT CHARTER FOR THE INTERNATIONAL COMMITTEE ON IRRADIATED CONCRETE (ICIC) / (IC)² IN NUCLEAR APPLICATIONS

1.0 PURPOSE

The general objective of the **International Committee on Irradiated Concrete (ICIC)** is to provide a forum for broad technical interactions in research on the effects of irradiation on concrete used in nuclear structural applications, such as nuclear facilities, storage, and disposal sites, and which will contribute to advancing the current state of knowledge.

Specific objectives are to:

1. Provide a forum for timely, informal information exchanges among organizations pursuing the identification, quantification, and modeling of the effects of radiation on concrete in commercial nuclear applications. Specifically, determinations of the effects of radiation damage as reflected by changes in engineering properties and their application to concrete are included.
2. Promote broad application of highly specialized or unique investigation techniques to relevant research materials of wide interest to develop improved understanding and predictions of the effects of radiation on concrete, cementitious composites, and its constituents.
3. Facilitate the conception, planning and guidance of new cooperative research programs, for example, by:
 - 1) Facilitating the collection (harvesting) and distribution of pedigreed materials suitable for concrete irradiation damage investigations and non-destructive testing (NDT).
 - 2) Promoting cross-institutional utilization of resources, where possible, which reflect mutual research interests or needs.
 - 3) Promoting and coordinating research on special problems.
4. Promote the transfer of research results to the evaluation of engineering property changes by nuclear service and the use of general codes and standards. A formal mechanism to achieve this could include holding symposia or workshops to highlight the effects of radiation damage on concrete and related materials.

2.0 STRUCTURE:

2.1 Membership Requirements, Obligations, and Rights

- 2.1.1 **Organizational Membership** in the ICIC is restricted to those organizations that are currently performing or funding research and development efforts relevant to the objectives of the ICIC.

Each Organizational Member designates a Principal Contact and agrees to make every reasonable effort to ensure that the Principal Contact or a designated alternate attends each ICIC meeting. Principal Contacts of Organizational Members have the right to recommend and approve appointments to the Executive Committee and changes to the Charter.

The ICIC Executive Committee consists of three officers (a Chairperson, a Vice-Chairperson, and a Secretary) and other members as discussed in section 2.2.1.

Principal Contacts are responsible for ensuring that members of their organizations and their invitees to meetings (see Section 2.1.5) abide by the requirements of the Charter, in particular regarding dissemination of information (Section 3.0).

- 2.1.2 **Individual Members** (this term includes Principal Contacts and members of the Executive Committee) in the ICIC must be employed by an Organizational Member and be actively involved in research or supporting research relevant to the objectives of the ICIC. As appropriate, the views of those Individual Members present at ICIC meetings on matters regarding the general operation of the ICIC will be gauged by show of hands.
- 2.1.3 **Processing of applications for Membership.** New applications for membership and/or member nominations for a new Principal Contact will be sent to the Secretary. The application should include evidence that the membership requirements of Section 2.1.2 and, for a new organization, Section 2.1.1 can be met. In the case of a new Individual Member this may consist of a brief resume and list of relevant publications or reports. The Secretary then distributes copies of the applications to the Executive Committee for review. Two procedures are available for membership review and approval: (1) Each Executive Committee member sends a written recommendation for approval (or disapproval) to the Secretary within 30 days after its receipt, and the application is approved if supported by at least 3/4 of the Executive Committee; (2) Membership application may be made and approved during a meeting of the Executive Committee. All applications will be acted upon fully within 2 months.
- 2.1.4 **Obligation to attend the General Meetings.** If an Organizational Member is not represented at two successive ICIC General Meetings, its membership will cease pending Executive Committee review. Normal membership application may be required before further participation is possible.
- 2.1.5 **Participation in General Meetings.** Participation in General Meetings is normally limited to those members who are contributing information as an author (or major co-author) of a presentation to be given at the meeting. With the approval of the Officers this requirement may be waived. Moreover, with the approval of the Officers, a Principal Contact or a Member of the Executive Committee may invite someone to participate in a meeting without applying for membership, provided that the invited participant makes a presentation and agrees to abide by the ICIC rules regarding confidentiality and dissemination of information (see section 3.0). Each presenter is required to provide a complete copy of the presentation to the organizing committee for the meeting record (see 3.0). In special circumstances, a Principal Contact may request a non-member to attend without presentation, which also must be approved by the Officers. In this case, an attendee will not be given copies of the presentations (see 3.0). (See section 4).

2.2. Organizational Structure

2.2.1 Executive Committee. The ICIC Executive Committee consists of three Officers (a Chairperson, a Vice-Chairperson, and a Secretary).

2.2.1.1 The Chairperson serves for 1 or 2 General Meetings. After serving that period, he or she will be succeeded by the Vice-Chairperson.

2.2.1.2 Duties of the Executive Committee include setting the general theme for each meeting (including decisions regarding special plenary presentations, workshops, etc.), selecting the date, location, and local host for each meeting based upon proposals received from any member, arranging the ICIC General Meetings, preparing meeting agendas, facilitating memberships.

2.2.1.3 The Vice-Chairperson will assist the Chairperson as requested and will serve in the absence of the Chairperson.

2.2.1.4 The Secretary will assist the Chairperson and Vice-Chairperson as requested, will prepare a draft agenda for each Executive Committee meeting, will record minutes of each Executive Committee Meeting, and will accomplish other tasks as delineated in various sections of this charter.

2.2.2 Technical Area Coordinators (TACs). Specific technical areas may be identified by the Executive Committee and a TAC for each area nominated for approval by vote of Principal Contacts (see 2.2.3). There is no explicit term of service for TACs. A main function of a TAC is to facilitate and expedite progress by the membership in the technical area. The TAC also arranges that portion of the General Meeting dealing with his or her activity area and is responsible for a written summary of any issues, accomplishments identified by the presentations, and subsequent discussions.

2.2.3 Appointment of Executive Committee Members, Officers, and TACs. When an opening for an Officer arises, the Chairperson will seek suggestions for nominees from Principal Contacts and other members of the Executive Committee. He or she will then draw up a short list of candidates in consultation with other Executive Committee members. Criteria for including candidates will include their suitability for the position, including their future availability and willingness to stand, and the need to maintain a balance of membership on the committee that represents the general membership. The Secretary, or in his or her absence the Chairperson, will send the list to Executive Committee members each of whom may cast as many votes as there are positions. Votes cast more than 30 days following distribution of the list will be void. The candidate receiving the most votes will receive the appointment. In the event of a tie, the Chairperson will have an additional casting vote.

When an opening for a TAC arises, the procedure will be as that for an Officer, except that Principal Contacts as well as the Executive Committee members will be entitled to vote. Voting will normally be by email to the address last notified to the Secretary.

3.0 DISSEMINATION OF INFORMATION

3.1. Information Specifically Developed or Contributed by a Member

Information specifically developed or contributed by a member (or invited non-member presenter as described in section 2.1.5) will not be disseminated, formally or informally, to outside bodies or individuals without the specific and explicit approval of the contributor and notification of the Executive Committee. Such information may be disseminated to non-members within an Organizational Member, but the Principal Contact must ensure that it is not disseminated further.

The conditions for release and dissemination of information developed by a coordinated activity of the ICIC will be determined in advance by the Executive Committee in consultation with the participants in the activity.

The proceedings of the General Meeting will consist of electronic copies of presentations and discussion summaries provided to all members and to all non-member presenters. **[restrictions on non-member presenters – to be discussed]**. The proceedings will not be given to non-member non-presenting attendees. Any material or information deemed to be of a sensitive nature will be so identified by the contributor in advance and will not be included in the meeting record.

The Secretary will prepare minutes of the Executive Committee meeting for distribution to each Executive Committee member.

3.2. Distribution of published / public information

The secretary will maintain a distribution list of where members may submit published materials to disseminate to members of ICIC. This list will be established to allow previously sensitive information, which becomes public, to reach members in a timely fashion.

3.3 Website for information

As appropriate, the secretary and executive committee will establish a dedicated website with both public and private access depending on the nature of the information.

4.0 MEETINGS

General Meetings of the ICIC will be held at intervals of approximately every 12 months. The language of the meetings will be English.

At each General Meeting, the Executive Committee will recommend the dates and location for the subsequent General Meeting to the members.

Each General Meeting will last approximately two (2)- three (3) days, one (1) – two (2) days of which typically will be devoted to technical discussions/presentations in workshop format and with one (1) to two (2) days devoted to open presentations. Attendance at the open session will be by invitation and may include regulators and other interested individuals.

A meeting of the Executive Committee normally precedes each General Meeting, while additional meetings of the Executive Committee and the various Task Groups are organized by the respective Chairpersons on an as-needed basis.

5.0 CHANGES TO CHARTER

The Officers will be responsible for ensuring that the requirements of the Charter are met, while the Secretary will be responsible for drafting amendments to the Charter to meet the changing requirements of the ICIC.

Any member may recommend changes to the Charter. The Secretary will send proposed Amendments to the Charter to Principal Contacts for a vote within 30 days of formal proposal.

The voting will be by email and will be adopted if over 2/3 of those Principal Contacts who respond within 30 days of the email being sent are in favor. Failure to respond will be assumed to be an abstention. The Secretary will notify all members of the outcome and distribute, if an amendment has been adopted, a revised Charter to all members within a further 30 days.

CHARTER ADDENDUM

Resource Sharing / Leveraging:

- Service Irradiated Concrete Cores
- Characterization of harvested cores
- Pre-Irradiation Evaluation Characterization.
- Post Irradiation Evaluation Characterization
- Round Robin Testing
- Establishing Characterization Protocols
- Modeling and Damage Mechanisms.

ESTABLISHING CHARACTERIZATION PROTOCOLS:

- Mechanical Testing (compressive strength, elastic modulus, etc.)
- Phase composition (with XRD)
- Microstructure (TEM/SEM/ Optical Microscopy)
- Porosity (Total)
- Dimensional changes (resolution)
- Mass (changes)
- DTA (water, portlandite and carbonate content)
- Hardness (nano indenter)
- Sorption balance
- Pore size
- NDE

COORDINATED RESEARCH ON SPECIAL PROBLEMS:

- IAEA CRP
- RILEM

International Irradiated Concrete Information Exchange Framework Meeting Agenda
12-14, March 2014
Hotel Colon, Barcelona, Spain

Wednesday, March 12, 2014

- 9:15 Coffee
- 9:30 Welcome / Agenda (Professor Andrade / Dr. Rosseel)
- 9:45 Introductions (All)
- 10:00 CSIC / Barcelona Overview (Andrade)
- 10:30 Meeting Goals / Objectives / Structure / Topics and discussion (Rosseel)
- 11:00 Proposed Organization Structure for an International Committee on Irradiated Concrete (Rosseel)
- 12:00 Lunch Break

Participant Presentations: Past / Current Irradiated Concrete Projects and Research: Overviews, Status, Results, and Project Issues

- 13:15 US: ORNL: LWRS Research Program on the Effects of Radiated on Structural Concrete (Rosseel)
- 14:00 Finland: Fortum: "Research on Irradiation Effects on Concrete Structures at the Loviisa NPP" (Eurajoki)
- 14:45 Spain: Technical Committee of Zorita: Harvesting Concrete from Zorita (Andrade)
- 15:15 Coffee
- 15:30 US: EPRI: Long Term Operations Concrete Research Program (Wall)
- 16:15 Czech Republic: UJV Rez: (Zdarek) Containment and RPV Concrete Cavity Research Activities
- 16:45 US: ORNL: Perspectives on Radiation Effects in Concrete: Review of Past Irradiation Programs and Determination of First Order Effects. (Field)
- 17:30 Finland: VTT: Centre for Nuclear Safety (Ferreira)
- 18:00 First Day Summary and Discussion (All)
- 18:30 Adjourn

International Irradiated Concrete Information Exchange Framework Meeting Agenda
12-14, March 2014
Hotel Colon, Barcelona, Spain

Thursday, March 13, 2014

8:45 Coffee / Announcements

Participant Presentations: (Continued)

9:00 Japan: Introduction - Japan Aging Management Program on System Safety (JAMPSS) (Takizawa)

9:20 Japan: Outline of Research of Irradiation Effects of Concrete Structure in JAMPSS (Kontani)

9:40 Japan: JAMPSS: Gamma-ray Irradiation Test Results (Kontani)

10:15 Break

10:25 Japan: JAMPSS: Preparation for Neutron Irradiation Experiments (Maruyama)

10:45 Japan: JAMPSS: Numerical Simulation for Irradiated Concrete (Maruyama)

11:15 Information Exchange Discussion: **Objectives** (Rosseel / All)

12:00 Lunch Break

13:00 Regulator's Position on **Information Security** (CSN: Castelao, NRC: Sircar)

13:15 Information Exchange Discussion: **Information Disseminated** (Rosseel / All)
Type of information (Summaries, presentations, papers, data)
Level of release (Public, participants only)
Website (Distribution control)

14:00 Information Exchange Discussion: **Framework / Areas for Cooperation** (Rosseel / All)
Resource Sharing (Rosseel/ All)
(Concrete cores; Pre-IE characterization; PIE characterization; Round Robin testing)
Data sharing

15:30 Coffee

15:45 Information Exchange Discussion: **Meeting Format** (Rosseel / All)
Open sessions (regulators, interested technical experts) / closed sessions
Frequency of meetings
Future meeting locations

17:00 Information Exchange Discussion: **Organizational Structure** (Rosseel / All)

18:00 Second Day Summary and Discussion

18:30 Adjourn / Dinner

International Irradiated Concrete Information Exchange Framework Meeting Agenda
12-14, March 2014
Hotel Colon, Barcelona, Spain

Friday, March 14, 2014

8:45 Coffee / Announcements

9:00 Information Exchange Discussion: **Additional Discussions as needed (All)**

10:00 Information Exchange Discussion: **Action Items and Decisions (Rosseel / All)**

11:00 Information Exchange Discussion: **Commitment to Participate (Rosseel / All)**

Selection of a future meeting chair / co-chair

Assignment of tasks (Rosseel / Andrade)

Closing Comments (Rosseel / Andrade)

12:00 Adjourn

Meeting Photos:



Group Photo: Back row: Takizawa, Zdarek, Martin, Wall, Kontani, Castelao, Serra, Ferreira, Sánchez, and Eurajoki; Seated: Ordóñez, Maruyama, Field, Sircar, Rosseel, Andrade, and Korhonen



Dr. Takizawa discussing the JAMPSS Irradiated Concrete Program

Attendance List
International Irradiated Concrete Information Exchange Framework Meeting
March 2014
Barcelona, Spain

| | Surname | First name | Country | Organization | Address |
|----|----------------|-------------------|----------------|---|---|
| 1 | Andrade | Carmen | Spain | National Research Council of Spain (CSIC) | Serrano Galvache, 4 St. 28033, Madrid, Spain |
| 2 | Ordóñez | Manuel | Spain | ENRESA | Manuel Ordóñez Álvarez Dpto de Ingeniería RBMA c/ Emilio Vargas, 7 28043 MADRID España www.enresa.es |
| 3 | Martín | José Román | Spain | CSN | Consejo de Seguridad Nuclear, C/ Pedro Justo Dorado Dellmans nº. 11, 28040, Madrid, Spain |
| 4 | Castelao | Carlos | Spain | CSN | Consejo de Seguridad Nuclear, Unidad de Investigación y Gestión del Conocimiento C/ Pedro Justo Dorado Dellmans nº. 11, 28040, Madrid, Spain |
| 5 | Serra | Eduardo | Spain | Endesa | Endesa Energía C/ Ribera del Loira, 60 28042 Madrid – España |
| 6 | Eurajoki | Tapani | Finland | Fortum | PO Box 100, FL-00048 Fortum, Finland, Kemistintie 1, Espoo Finland |
| 7 | Korhonen | Ritva | Finland | Fortum | PO Box 100, FL-00048 Fortum, Finland, Kemistintie 1, Espoo, Finland |
| 8 | Ferreira | Miguel | Finland | VTT Technical Research Centre of Finland | Kemistintie 3, Espoo P.O. Box 1000, FI-02044, Finland |
| 9 | Wall | James (Joe) | USA | Electric Power Research Institute (EPRI) | 1300 West HT Harris BLVD, Charlotte, NC, 28221, USA |
| 10 | Field | Kevin | USA | Oak Ridge National Laboratory (ORNL) | PO Box Box 2008, Oak Ridge, TN 37831, USA |
| 11 | Rossee | Thomas (Tom) | USA | Oak Ridge National Laboratory (ORNL) | PO Box Box 2008, Oak Ridge, TN 37831, USA |
| 12 | Takizawa | Masayuki | Japan | Mitsubishi Research Institute | 2-10-3 Nagatacho, Chiyoda-ku, Tokyo 100-8141, Japan |
| | | | | | |
| | | | | | |

| | Surname | First name | Country | Organization | Address |
|----|----------------|-------------------|-------------------|---|--|
| 13 | Maruyama | Ippei | Japan | Nagoya University | Furocho, Chikusa-ku, Nagoya, 464-8603, Japan |
| 14 | Kontani | Osamu | Japan | Kajima Corporation | 6-5-11 Akasaka, Minato-ku, Tokyo, 107-8348, Japan |
| 15 | Sircar | Madhumita | USA | U.S. Nuclear Regulatory Commission | Office of Nuclear Regulatory Research, 21 Church Street, 5A15, Rockville, MD 20850 |
| 16 | Sánchez | Javier | Spain | National Research Council of Spain (CSIC) | Serrano Galvache, 4 St. 28033, Madrid, Spain |
| 17 | Navarro | Federico | Spain | tecnatom; Components Engineering Inspection and Testing Services | Avda. Montes de Oca, 1. 28703 San Sebastián de los Reyes, Madrid, Spain |
| 18 | Zdarek | Jiri | Czech Republic | Nuclear Research Institute Rez plc | Husinec-Rez 130 CZ-250 68 Czech Republic |
| 19 | Ruščák | Martin | Czech Republic | Nuclear Research Institute Rez plc | Husinec-Rez 130 CZ-250 68 Czech Republic |



International Irradiated Concrete Information Exchange Web Site:

http://web.ornl.gov/sci/physical_sciences_directorate/mst/IICIEF/index.shtml

[Organizing Committee](#)

[Participant Confirmation](#)

[Agenda](#) (link to presentation pdfs)

[Presentations](#)

[Charter](#)

[Photos](#)

[Attendance List](#)

[Hotel Accommodations](#)

[Venue](#)